ESG to SDG: Do Sustainable Investing Ratings Align with the Sustainability Preferences of Investors, Regulators, and Scientists?

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Abstract

Sustainable investors aim to invest in companies that contribute to sustainable development. However, there is disagreement on how best to measure corporate sustainability performance. We assess the construct validity of two types of sustainability ratings: (i) a novel score that measures companies' impacts on the Sustainable Development Goals (SDGs); and (ii) established ESG ratings that assess if companies face environmental, social, and governance risks. We develop three tests that gauge if these sustainability ratings can identify companies that investors, regulators, and scientists view as being (un)sustainable. Our findings show that, unlike ESG ratings, the SDG score: (i) captures investors' revealed sustainability preferences; (ii) aligns with the EU taxonomy regulation; and (iii) supports climate change mitigation. We conclude that, as a sustainability rating, the SDG score has high, and ESG ratings low, construct validity. While concepts like ESG, sustainability, and impact can be used complementarily, we caution against using them interchangeably.

Keywords: Sustainable investing; Sustainability ratings; ESG; impact investing; Sustainable Development Goals (SDGs); sustainable finance; EU taxonomy; climate change

1. INTRODUCTION

Do sustainable investors use metrics that adequately reveal if their investments contribute to social and planetary wellbeing? This can be doubted. The dominant metric used in sustainable investing is an ESG rating[1] that measures how companies perform on diverse Environmental, Social, and Governance attributes (Fiaschi, Giuliani, Nieri & Salvati, 2020; Linnenluecke, 2022; Popescu, Hitaj & Benetto, 2021; Scheitza, Busch, & Metzler, 2022). But despite their prominence, ESG ratings are under fire. A recent list of top ESG-rated companies for instance included British American Tobacco, Glencore, and Coca-Cola HBC, stirring an intense debate on ESG rating's ignorance of these companies' adverse impacts[2]. Such results led Bloomberg

[1] For instance, ESG integration is estimated to account for 71% of the USD 35.4 trillion in assets that are labeled as being invested sustainably (GSIA, 2021).

[2] https://www.responsible-investor.com/articles/refinitiv-s-inclusion-of-tobacco-pharma-and-mining-in-esg-top-five-divides-opinion

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to speak of an *"ESG mirage"*[3] while the Economist dubbed ESG to be *"three letters that won't save the planet"*[4].

This presents a challenge for sustainable investors. Sustainable investing is *"a generic term for investments that seek to contribute toward sustainable development"* (Busch, Bauer & Orlitzky., 2016:304)[5]. Sustainable investors must therefore understand the environmental and social impacts of the companies they invest in. With sustainability ratings that determine companies' contributions to sustainable development, investors can allocate financing to companies with positive impacts and away from those with negative impact. Obviously, if sustainability ratings inadequately measure if companies contribute to sustainable development, then investment strategies based on these ratings will fall short of achieving their sustainability objectives (Dimson et al., 2020a).

Notwithstanding the rapidly growing academic interest in sustainable investing, few efforts have assessed how the sustainability performance of investments is measured (Drempetic et al., 2019; Kölbel et al., 2020; Losse & Geissdoerfer, 2021; Popescu et al., 2021). This presents a significant gap in the literature (Capelle-Blancard & Monjon, 2012; Diaz-Rainey et al., 2017; Revelli, 2017; van Dijk-de Groot & Nijhof, 2015). Researchers have consequently been called upon to investigate what types of indicators sustainable investors need in order to advance sustainability objectives (Drempetic et al., 2019), and how such metrics and their methodologies might be validated (Cort & Esty, 2020).

This paper responds to these calls by developing three complementary tests for gauging if sustainability ratings adequately measure companies' contributions to sustainable development. Jointly, these tests determine if sustainability ratings can identify companies that investors, regulators, and scientists view as being (un)sustainable. First, we test if sustainability ratings capture investors' revealed sustainability preferences. We do this by assessing if poor scores are assigned to companies that are on asset owners' exclusion lists and if good scores are awarded to firms included in sustainable thematic funds. Second, we measure how well sustainability ratings correspond to the EU taxonomy, as an important emerging sustainable investing regulation. This test surveys if poor scores are assigned to companies breaching the EU taxonomy's 'do-no-significant-harm' (DNSH) principle and if good scores are given to

[3] https://www.bloomberg.com/graphics/2021-what-is-esg-investing-msci-ratings-focus-on-corporate-bottom-line/

[4] https://www.economist.com/weeklyedition/2022-07-23

[5]Similarly, the European Union defines a sustainable investment as "an investment in an economic activity that contributes to an environmental objective, […], or an investment in an economic activity that contributes to a social objective, […], provided that such investments do not significantly harm any of those objectives and that the investee companies follow good governance practices […]" (European Union, 2019:8).

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companies generating the majority of their revenues from activities that the taxonomy views as helping tackle climate change. Third, we test if sustainability ratings are supportive of climate change mitigation ambitions by analyzing if the majority of companies with severe greenhouse gas (GHG) emissions get poor ratings.

We apply these tests to two types of sustainability ratings. The first is an SDG score, which measures companies' contributions to the Sustainable Development Goals. As a second metric we use ESG ratings of four providers, that generally measure companies' exposure to, and management of, sustainability risks. By including these two conceptually different metrics we have an opportunity to test if the more novel SDG score is sufficiently distinct from – and thus enjoys discriminant validity relative to – established ESG ratings.

We find that the SDG score does well on all three tests. Companies that are on exclusion lists, that breach the EU taxonomy's DNSH principle, and that rank among the top contributors to climate change primarily get negative scores. At the same time, SDG scores for companies included in sustainable thematic funds and for companies generating most of their revenues from EU taxonomy-aligned activities are overwhelmingly positive. Hence, the SDG score captures both companies' positive and negative impacts. This contrasts ESG ratings, which we find are unable to distinguish between companies that investors, regulators, and climate scientists find sustainable, unsustainable, and the broader benchmark. We conclude that the SDG score has high, and ESG ratings low, construct validity as a sustainability rating. The SDG score furthermore enjoys discriminant validity compared to ESG ratings. This could make these metrics complementary: whereas the SDG score can align investments with sustainable development ambitions, ESG ratings might help avoid financially material ESG risks. Based on these conclusions, we advise against using concepts like ESG, sustainability, and impact interchangeably.

The next section provides a background to our analysis. Section 3 introduces the SDG score and ESG ratings that we use in our study. Section 4 explains the empirical tests we develop to measure the construct validity of these sustainability ratings and the discriminant validity between them. Results are presented in section 5, followed by a discussion in section 5. The last section summarizes our findings and their importance.

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2. WHAT SHOULD SUSTAINABILITY RATINGS MEASURE?

Sustainable investors aim to contribute to sustainable development (Busch et al., 2016). In line with this objective, we propose that sustainability ratings ought to measure the extent to which companies positively or negatively impact sustainable development. Sustainability ratings can then help investors align their asset allocation with sustainable development ambitions (e.g., Busch et al., 2021) and apply active ownership to further improve the sustainability impacts of investee companies (Barko, Cremers & Renneboog, 2021; Bauer, Derwall, & Tissen, 2022; de Groot, de Koning, & van Winkel, 2021; Dimson & Karakas, 2015).

Yet sustainable development, commonly understood as *"development that meets the needs of the present without compromising the ability of future generations to meet their own needs"* (WCED, 1987), is a contested concept that comprises diverse topics (Leach et al., 2018; Redclift, 2005). This lack of consensus on what topics support sustainable development make it difficult to determine corporate sustainability performance. How can sustainability ratings measure companies' impacts on sustainable development without a clear understanding of what sustainable development entails?

The SDGs help overcome this challenge. These 17 goals, with their 169 underlying targets, were adopted by all United Nations (UN) member states, thereby creating a universal sustainable development agenda (Pattberg & Widerberg, 2016; Stevens & Kanie, 2016; UN, 2015). They not only are relevant for governments (Sachs, 2015) but also for companies (Mio, Panfilo & Blundo, 2020; van Tulder, Rodrigues, Mirza & Sexsmith, 2021; van Zanten & van Tulder, 2018; 2021) and investors (Chen, Mussalli, Amel-Zadeh & Weinberg, 2021; Schramade, 2017). This leads the SDGs to provide a global and detailed clarification of the objectives of sustainable development. Consequently, sustainable investing requires knowing how companies contribute to the objectives set out by the SDGs.

How do ESG ratings, as the currently dominant metric used in sustainable investing (Fiaschi et al., 2020; Linnenluecke, 2022; Popescu et al., 2021; Scheitza et al., 2022), align with this objective? We note three challenges. First, although the ESG concept was originally motivated by the argument that the consideration of ESG factors would *"contribute to the sustainable development of societies"* (IFC, 2004:2), in the past decade ESG assessments have increasingly shifted away from sustainable development and instead focused more on measuring companies' exposure to financial risks that stem from environmental, social, and governance factors (Giese, Lee, Melas, Nagy & Nishikawa, 2019; Popescu et al., 2021). With

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this focus, ESG ratings primarily assess if a firm's financial performance may be influenced by ESG (Amel-Zadeh & Serafeim, 2018), not if the firm contributes to a better world. Second, ESG ratings from different providers are poorly correlated (Berg; Koelbel & Rigobon, 2022; Billio, Costola, Hristova, Latino & Pelizzon, 2020; Dimson, Marsh & Staunton, 2020a; Kotsantonis & Serafeim, 2019). The result is a situation of *"aggregate confusion"* about what it is that ESG measures, which in part is caused by a lack of consensus on what topics should be measured (Berg et al., 2022). Third, ESG ratings are found to have biases that suggest they do not (fully) measure contributions to sustainable development. For instance, large companies have better ESG ratings than smaller ones (Akgun, Mudge & Townsend, 2021; Artiach, Lee, Nelson & Walker, 2010; Gallo & Christensen, 2011) and firms from developed countries do better than those from emerging markets (Arminen, Puumalainen, Pätäri & Fellnhofer, 2018; Ho, Wang, & Vitell, 2012). But this does not necessarily mean that larger companies, and those from developed markets, are more sustainable. Rather, larger companies have more resources for ESG data disclosure (Drempetic, Klein & Zwergel., 2019) while country-characteristics explain geographic differences in ESG ratings (Cai, Pan & Statman, 2016).

Although they are prominent, ESG ratings are not the only type of metric available to sustainable investors. In recent years, various new types of metrics have been developed that shed light on companies' sustainability performance. In section 3, we introduce the sustainability ratings that we use in our empirical analysis, whereby we use one novel metric that gauges companies' contributions to the SDGs next to well-known ESG ratings.

3. DATA: SDG SCORE AND ESG RATINGS

We introduce an SDG score (3.1) and discuss the ESG ratings (3.2) that are used in our empirical analysis. We compare these two types of metrics in 3.3.

3.1 SDG score

We introduce Robeco's SDG score as a novel sustainability rating. This score measures companies' contributions to the SDGs through a three-step framework. The first step follows a rules-based approach to assess the impacts of a company's products or services. Key performance indicators (KPIs) determine which SDGs are impacted by particular products and services, whereby thresholds specify how strong that impact is. For example, a KPI for food companies is the percentage revenues generated from selling nutritious food products. If this exceeds a particular threshold the score on SDGs 2 and 3 (Zero Hunger; Good Health and

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Wellbeing) can become positive. The second step determines if the company's business conduct contributes positively or negatively to SDGs. Examples of factors that are assessed include gender equality, environmental management, and corporate governance. The final step investigates if the company faces controversies, like corruption, fraud, or environmental accidents. If it does, analysts survey if the company took action to remedy the adverse impact that has occurred and to prevent similar occurrences in the future.

With this three-step assessment companies are scored on their contributions to each of the SDGs. Seven types of SDG scores are possible: low, medium, and high positive scores (+1; +2; +3); neutral scores (0) that signal that a company does not have any significant contributions to the SDGs; and low, medium, and high negative scores (-1; -2; -3). Once a company's impacts on the 17 SDGs has been scored, its overall SDG score is calculated. This is done according to what Robeco calls its 'min-max' rule: a company without any negative scores for any individual SDG is assigned the highest (max) score as its overall score. But if a company has a negative score for any of the SDGs, it will receive the lowest (min) score as its overall SDG score. For detailed information on the methodology, see Robeco (2021).

3.2 ESG ratings

We include ESG ratings of four providers. Using multiple ESG ratings is important due to their low correlation (Berg et al., 2022; Dimson et al., 2020a) and because investors or academics may use different ESG ratings (Eccles, Lee, & Stroehle, 2020).

First, Sustainalytics' Company ESG Risk Rating measures a company's exposure to, and management of, industry-specific, and financially material, ESG risks. Sustainalytics explains that its ESG risk rating *"measures the degree to which a company's economic value is at risk driven by ESG factors"* (Sustainalytics, 2021). Second, Refinitiv's ESG rating measures a company's relative ESG performance. The rating accounts for industry materiality and company size biases, helping investors *" make sound, sustainable investment decisions"* (Refinitiv, 2021). Third, S&P's ESG rating is built on the Corporate Sustainability Assessment (CSA) (formerly RobecoSAM CSA). This evaluation focuses on industry-specific and financially material sustainability criteria. The rating comprises the financial and societal impact of ESG factors, and can be used *"as KPI for sustainability-linked financing or to build thematic portfolios"* (S&P, 2021). Fourth, MSCI's ESG rating measures how resilient a company is to long-term, industry material ESG risks. MSCI explains that its ESG ratings aim

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to provide *"institutional investors with a more robust ESG integration tool designed to support ESG risk mitigation and long term value creation"* (MSCI, 2021).

3.3 Correlation between SDG score and ESG ratings

Robeco's SDG score captures companies' contributions to the SDGs while ESG ratings, notwithstanding differences in focus among the various providers, measure companies' exposure to, and management of, financially material ESG risks. Hence, despite a shared focus on sustainability, these are different concepts. How do these scores, SDG and ESG, compare to one another?

We gauge the correlation between a company's SDG score and its ESG rating using data from December 2021. Our sample is the MSCI All Countries World Index (ACWI). This index contains over 2,900 large- and mid-cap constituents from 23 developed and 25 emerging markets, across 11 sectors and cover some 85% of the free float-adjusted market capitalization in each market (MSCI, 2022).

As expected, we find that a company's SDG score is uncorrelated to its ESG rating. Pearson correlation coefficients between these sustainability ratings are on average 0.07. The correlation between the SDG score and the ESG scores of Sustainalytics, S&P, Refinitiv, and MSCI respectively are 0.16, 0.01, 0.03, and 0.08. This lack of correlation between a company's SDG score and its ESG rating is visualized in figure 1, which shows how ESG scores of the four providers are distributed (vertical) for companies with one of seven types of SDG scores (horizontal). If a company's ESG rating would be positively related to its SDG score then we would have seen higher ESG scores for companies with positive SDG scores (in blue) compared to those with negative SDG scores (in pink).

--- insert figure 1 ---

4. PROPOSITIONS AND METHODOLOGY

A company's SDG score is not related to its ESG rating. How might we test if a sustainability rating adequately measures sustainability performance?

As there are no objective lists of which companies are (un)sustainable, we develop three complementary ways of investigating this question: we test if sustainability ratings align with: (i) investors' revealed sustainability preferences; (ii) sustainable investing regulation; and (iii) climate science. Throughout these three tests we capture both companies' positive and their

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negative effects. This combination is important because sustainable development aims to prevent negative impacts (i.e., avoiding harm) while simultaneously promoting positive impact (i.e., doing good) (van Zanten & van Tulder, 2018). We create propositions that determine what an adequate sustainability rating looks like in relation to each test.

4.1 Investors' revealed sustainability preferences

Our first test surveys if sustainability ratings align with the revealed sustainability preferences of investors. We examine two dimensions of observed sustainable investing strategies.

First, we assess if sustainability ratings can identify companies that are on asset owners' exclusion lists. Exclusion lists contain companies that are severely misaligned with investors' values, such as companies selling controversial weapons, violating human rights, or causing environmental destruction. These companies are excluded from the investable universe. Because excluding companies limits the opportunities for generating financial performance, exclusion is a rigorous measure that is reserved for the worst companies in the universe (e.g., Blitz & Fabozzi, 2017; Blitz & Swinkels, 2020; 2021; Dimson, Marsh & Staunton, 2020b). On this basis we propose:

> **Proposition 1a:** *Adequate sustainability ratings assign poor scores to companies that investors exclude from their investable universe for sustainability reasons.*

To test this proposition, we collected exclusion lists from seven asset owners (Table 1) and compare these companies' SDG scores and ESG ratings to those of the benchmark companies. The sum of companies on these exclusion lists is 1,477. We removed duplicates, leading to 725 unique companies. For 672 companies we were able collect SDG scores and ESG ratings[10]. These were categorized into three groups based on the reason of their exclusion: (i) human rights violations and/or involvement in controversial weapons; (ii) manufacturing and/or distributing of tobacco and/or cannabis products; and (iii) involvement in thermal coal and/or causing other environmental damage.

--- insert table 1 ---

Second, we test if sustainability ratings can identify companies that are included in market-leading sustainable thematic funds. Such funds are centered around a particular

[10]On average, a company is excluded by 1.5 asset owners. 73 companies are on the exclusion lists of three or more investors. We retain all companies in our study, rather than selecting those that are excluded by multiple investors, to avoid selection bias.

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sustainability theme. The companies that are invested in by these funds can be seen as providing sustainability solutions according to the fund managers. Our proposition is:

> **Proposition 1b:** *Adequate sustainability ratings assign good scores to companies that are included in sustainable thematic investment strategies.*

To test this proposition, we assess the SDG and ESG performance of companies included in leading sustainable thematic funds relative to the benchmark. We focus on three themes: energy, water, and health. We chose these because they comprise relevant environmental and social dimensions of sustainable development that are well established in the sustainable investing industry. We identified funds or ETFs with considerable track-records. In total, we analyzed the holdings of 17 funds/ETFs (Table 2). 1,082 companies were invested in by these funds. As different funds can invest in the same companies we removed duplicates, leading to 598 unique firms.

--- insert table 2 ---

4.2 Sustainable investing regulation: the EU taxonomy

Our second test investigates how well sustainability ratings align with sustainable investing regulation. In recent years regulators have increasingly passed regulation governing sustainable investing (Ahlström & Monciardini, 2022). The EU taxonomy is a prime example.

The EU taxonomy is a classification system for sustainable economic activities. It establishes technical screening criteria that determine the conditions under which economic activities: (i) qualify as contributing to one or more of six environmental objectives[11]; and (ii) do not cause significant harm to one or more of those environmental objectives (European Commission, 2021). These screening criteria apply to economic sectors. To be aligned with the EU taxonomy, activities must furthermore comply with minimum social safeguards, such as those represented by major ILO conventions, OECD Guidelines for Multinational Enterprises, and the UN Guiding Principles on Business and Human Rights. With these technical screening criteria the EU has adopted into its regulatory framework definitions of which types of corporate activities provide solutions for promoting environmental sustainability, while simultaneously defining what types of behavior violate the 'do no significant harm' (DNSH) principle. With this taxonomy the EU wants to support investors to channel financing towards

[11]The Taxonomy Regulation establishes six environmental objectives: (i) climate change mitigation; (ii) climate change adaptation; (iii) The sustainable use and protection of water and marine resources; (iv) the transition to a circular economy; (v) pollution prevention and control; (vi) the protection and restoration of biodiversity and ecosystems.

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companies that help meet the EU's 2030 climate and energy targets and attain the European green deal, while also reducing greenwashing in the financial sector, and helping companies to become more environmentally sustainable (European Commission, 2022).

The EU taxonomy thereby offers a tool for testing the validity of sustainability ratings. On the one hand, it can be proposed that a good metric of sustainability performance should assign poor ratings to companies causing significant harm to environmental objectives (proposition 2a). On the other hand, it can be suggested that good ratings should be given to companies that provide solutions to promoting environmental objectives (proposition 2b).

> **Proposition 2a:** *Adequate sustainability ratings assign poor scores to companies that violate the EU taxonomy's Do No Significant Harm principle.*
>
> **Proposition 2b:** *Adequate sustainability ratings assign good scores to companies that have significant shares of EU taxonomy-aligned revenues.*

To test these propositions, we collect data on companies' alignment with the EU taxonomy from Sustainalytics. Our sample is MSCI ACWI. In order to assess proposition 2a, we use the Sustainalytics datapoint 'overall DNSH breach flag'. This metric gauges whether an individual company is breaching the taxonomy's DNSH principle. 23 companies are flagged. To assess proposition 2b, we use the Sustainalytics datapoint 'overall percentage of aligned revenue', which describes the percentage of a company's revenues that can be considered to be aligned with the EU taxonomy's climate change mitigation and adaptation objectives[13]. From this list, we select the 82 companies that generate over 66% of their revenues from activities that help tackle climate change in line with the EU taxonomy's technical screening criteria[14]. These can be considered to be companies providing environmental sustainability solutions. For both groups, we compare their SDG and ESG performance relative to the scores of the companies in the benchmark.

4.3 Climate science: Greenhouse gas emissions

[13] At the time of writing, the EU has adopted technical screening criteria for two of its six environmental objectives, which are climate change mitigation and climate change adaptation.

[14] 406 companies in the MSCI ACWI benchmark that are under coverage by Sustainalytics generate more than 0% revenues from EU taxonomy aligned activities and thus provide products that contribute to climate change mitigation. It is interesting to note that out of these 406 companies, 98 generate less than 1% of revenues from such activities. 125 companies have anywhere between 1% and 10% of EU taxonomy aligned revenues; 65 companies generate between 10% and 33% of their sales from climate change mitigation products; 33 firms have between 33% and 66% of their revenues from EU taxonomy aligned activities; and 82 firms generate more than two-thirds of their sales from these activities. It therefore appears that climate change mitigation either is a side-activity for companies – accounting for a small share of overall revenues – or that it requires specialization and thus accounts for the majority of companies' revenues. In between these ends we find far fewer companies that generate moderate to significant shares of taxonomy aligned revenues.

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Our final test surveys how well sustainability ratings capture companies' greenhouse gas (GHG) emissions. The aim is to determine if such metrics can identify the companies that are the major drivers of climate change. This test is important from a climate science perspective.

Anthropogenic GHG emissions cause global warming (IPCC, 2021). Compared to pre-industrial levels, global average temperatures have risen by 1.1°C (IPCC, 2021). The consequences of climate change are already noticeable in the degradation of ecosystems, erosion of biodiversity, disruption of food productions systems, and an increase in frequency and severity of natural hazards – like storms, droughts, and floods (IPCC, 2022). Scientists predict that climate change, if left unmitigated, will make life on Earth much less hospitable to human wellbeing, likely in irreversible ways (Rockström et al., 2009; Steffen et al., 2015). Companies are important in mitigating climate change: just 100 companies have been responsible for over 70% of GHG emissions since 1988 (Carbon Disclosure Project, 2017). Hence, sustainable investors do well to understand which firms are the main drivers of climate change (e.g., Galaz, Crona, Dauriach, Scholtens & Steffen, 2018). We propose:

> **Proposition 3a:** *Adequate sustainability ratings assign poor scores to the majority of companies that have high greenhouse gas emissions.*

To test this proposition, we apply an absolute and a relative perspective[15]. First, we collect GHG emissions data from TruCost for the companies in MSCI ACWI. We focus on scope 1 (direct emissions from operations, including owned or controlled sources), scope 2 (indirect emissions from purchased consumed energy), and scope 3 (indirect emissions that occur up- and downstream in the value chain). We sum each company's scope 1 and 2 emissions and keep scope 3 separate. Then we assess how much of the benchmark's absolute emissions are covered by a negative SDG score and a poor ESG rating (a high or severe ESG risk rating from Sustainalytics; an ESG laggard classification from MSCI; or being rated in the bottom-25% by Refinitiv and S&P). This gives us an insight into how well sustainability ratings capture absolute GHG emissions.

Secondly, we collect data on companies' revenues. By combining companies' emissions and their revenues, we calculate each company's GHG intensity. This way, we know which companies have the highest emissions per unit of revenues, allowing us to compare companies

[15]Understanding companies' impacts on climate change first of all requires an absolute view on corporate emissions. The reason is that the carbon budget for keeping global warming below 2°C is absolute. However, focusing on absolute emissions introduces a size bias, whereby companies of larger sizes are expected to have higher emissions compared to smaller sizes. It also overlooks how efficient companies are at increasing revenues while decreasing emissions, which is an important metric for companies to manage their impacts on climate change. We therefore also provide a relative perspective, looking at emissions per unit of revenue (GHG intensity).

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of different sizes. We calculate two types of GHG intensities: one for companies' summed scope 1 and 2 emissions; and one for companies' scope 3 emissions. With these GHG intensities we create two samples of companies. The first sample includes the 100 companies with the highest scope 1 and 2 intensity, the second comprises the 100 firms with the largest scope 3 intensity[16]. We compare the SDG and ESG performance of these two groups to the rest of the companies in the benchmark. We use 2019 as a baseline, to avoid any abnormal fluctuations in companies' GHG emissions caused by the Covid-19 pandemic.

5. RESULTS

This section presents how the SDG score and ESG ratings do on each of our propositions and subsequently offers company examples that illustrate these results.

5.1 Do sustainability ratings align with investors' revealed sustainability preferences?

5.1.1 SDG score

Figure 2 shows how SDG scores are distributed for companies on asset owners' exclusion lists (pink) and for companies held by sustainable thematic funds (blue). We also show how SDG scores are distributed for the MSCI ACWI constituents as a relevant benchmark (grey).

--- insert figure 2 ---

The majority (87%) of excluded companies gets a negative SDG score, with 3% and 10% respectively receiving neutral and positive scores. The median SDG score of excluded companies is -2, indicating that these firms exert negative-medium impact on the SDGs. In contrast, we find that most companies in sustainable thematic funds obtain a positive SDG score. 86%, 6% and 7% of these companies get positive, neutral, and negative SDG scores. The median SDG score of these companies is +2, signaling that they make medium-positive contributions to sustainable development. These findings are similar for companies in different exclusion categories, as well as across companies in differently themed sustainable funds, indicating that the results are consistent for different dimensions of sustainability performance. The distribution of SDG scores of excluded companies is significantly lower ($U = 223999; p < .001$), and the SDG scores of sustainable thematic firms are significantly higher

[16]We find that the 100 highest emitting companies from a summed scope 1 and 2 intensity perspective account for 67% of MSCI ACWI's absolute scope 1 and 2 emissions. The 100 highest emitting companies from a scope 3 intensity perspective account for 63% of the benchmark's absolute scope 3 emissions. This implies that companies that have high GHG emissions per unit of revenue (i.e. high GHG intensity) also account for the lion share of absolute emissions.

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($U = 557073; p < .001$) than the scores of the companies in MSCI ACWI (median SDG score = +1).

5.1.2 ESG ratings

Figure 3 shows the same assessment for the ESG scores of the four providers. We find no strong distinction in ESG performance between excluded companies, sustainable companies, and those in the benchmark.

--- insert figure 3 ---

Excluded companies show diversity in the extent to which they get a poor ESG rating. MSCI rates 21% as ESG laggards. Refinitiv and S&P respectively rank 27% and 41% in the bottom quartile (compared to MSCI ACWI). And Sustainalytics states that 65% faces high or severe ESG risks. The rest of the companies are average (65%) or leading (14%) ESG companies according to MSCI; have medium (28%) or low (8%) ESG risk according to Sustainalytics; or respectively rank in the mid-50% (23%; 42%) or top-25% (50%; 17%) according to Refinitiv and S&P. Although there is some variation in ESG performance across the exclusion themes, no provider unequivocally gives poor scores to the majority of these firms. Sustainalytics gives worse average ESG ratings to excluded companies than to those in the benchmark whereby these differences are statistically significant ($z = 16.372; p < .001$). S&P gives slightly lower ESG ratings to excluded companies than benchmark firms S&P ($z = 5.336; p < .001$). MSCI assigns a median rating of 0 (or BBB in the alphabetical rating) to excluded companies as well as those in the benchmark, yet the distribution in ratings is found to differ between these groups ($z = 3.667; p < .001$). Excluded companies receive better ratings than firms in the benchmark in Refinitiv's assessment ($z = -2.772; p = .003$).

We find similar diversity in ESG performance among companies in sustainable thematic funds. MSCI rates 38% of these companies as an ESG leader, 58% as average, and 4% as laggards. According to Sustainalytics, 30%, 45%, and 25% of these companies respectively face low, medium, and high ESG risk. Refinitiv and S&P rate 29% and 28% of the companies in these funds in the top-quartile compared to the benchmark. These two agencies furthermore respectively rate 43% and 55% in the middle two quartiles, and 28% and 17% in the bottom quartile. The results are relatively comparable for each of the three sustainable themes. No statistically significant differences were found between the ESG ratings for sustainable thematic companies and the companies in the benchmark for the ratings of

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Sustainalytics ($z = -0.874; p = .191$), Refinitiv ($z = -0.173; p = .431$) and S&P ($z = -0.415; p = .339$). With a median rating of 1 (A – or average in the alphabetical rating), the MSCI ESG rating is slightly higher for sustainable thematic companies than the benchmark companies, whose ESG rating is 0 (BBB – or average in the alphabetical rating), which is a statistically significant difference ($z = -12{,}385; p < .001$).

5.2 Do sustainability ratings align with sustainable finance regulation?

5.2.1 SDG score

Figure 4 compares SDG scores for companies that violate the EU taxonomy's DNSH principle (pink), for firms generating varying proportions of revenues from activities that the taxonomy views as helping mitigate or adapt to climate change (blue), and the benchmark (grey).

--- insert figure 4 ---

All 23 companies that breach the EU taxonomy's DNSH principle, and that thus cause harm, have a negative SDG score. Their median score is -2, signaling that they have medium negative impact on the SDGs. This is significantly lower than the +1 median SDG score of the benchmark companies ($U = 31513; p < .001$). Among the companies with EU Taxonomy-aligned revenues we find more diverse SDG scores. Firms generating <33% of revenues from activities that help tackle climate change show dispersed SDG scores. In contrast, the 81 companies with >66% taxonomy-aligned revenues have a median SDG score of +3, indicating that they have highly positive impact on the SDGs. Again, this is significantly higher compared to the benchmark's SDG scores ($U = 107853; p < .001$). We also test the correlation between a company's SDG score and its percentage of taxonomy aligned revenues, with our sample being the 405 companies in the benchmark with more than 0% revenues from taxonomy aligned activities. The Pearson correlation coefficient is 0.41.

5.2.2 ESG ratings

The same test is done for each of the four types of ESG ratings in this study. Figure 5 visualizes the results.

--- insert figure 5 ---

The ESG performance of companies that breach the EU taxonomy's DNSH principle varies depending on the rating agency. Of the 21 firms covered by Sustainalytics, 16 are rated as having high or severe ESG risks, 4 have medium risk, and 1 firm is seen to be low-risk.

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These companies' ratings are lower than the average Sustainalytics ESG rating of the companies in the benchmark ($t = 3.997; p < .001$). Out of 23 companies, MSCI rates 11 as ESG laggards, 1 as ESG leader, and 11 as average ESG performers, leading these companies to have slightly poorer ESG performance than the benchmark (median score of -1 compared to 0; $t = 3.628; p < .001$). Refinitiv rates 8 of the 17 companies it assesses within the top-25% of ESG rated companies in the benchmark, and 1 company in the bottom-25%. Companies causing harm thereby have better Refinitiv ESG ratings than the benchmark ($t = -2.77; p = .006$). Similarly, S&P rates 14 of the 21 companies within its scope in the top-25% of ESG rated companies in the universe, with 2 companies being rated in the bottom-25%. The companies violating the DNSH principle thereby have a better S&P ESG profile compared to the benchmark ($t = -4.056; p < .001$).

The ESG rating of companies generating over two-thirds of their revenues from activities in line with the EU taxonomy is similar to the ESG performance of the benchmark. Sustainalytics classifies 45%, 37.5%, and 17.5% of these companies as having low, medium and high ESG risk. This is the only provider giving slightly better ratings to these companies compared to the benchmark ($z = -3.236; p = .001$). These companies receive similar ratings compared to the companies in the benchmark in the ratings of Refinitiv ($z = 0.05; p = 0.959$), S&P ($z = 0.333; p = 0.738$), and MSCI ($z = -0.414; p = 0.339$). We also test whether a company's ESG rating is correlated to its degree of taxonomy-aligned revenues. We find Pearson correlation coefficients of 0.22, -0.12, -0.22, and -0.06 describing the relations between the ESG ratings of Sustainalytics, Refinitiv, S&P and MSCI, and companies' shares of EU taxonomy-aligned revenues.

5.3 Do sustainability ratings align with climate science?

5.3.1 SDG score

We find that companies with a negative SDG score (-1; -2; and -3) account for 62% of all absolute scope 1 and 2 emissions in MSCI ACWI, and for 60% of the benchmark's scope 3 emissions. Figure 6 shows the distribution of SDG scores of the 100 highest emitting companies.

--- insert figure 6 ---

The top-100 scope 1 and 2 emitting companies have a median SDG score of -3, which is significantly lower than the benchmark ($U = 72024; p < .001$). The 100 firms that have the

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largest scope 3 emissions have a median SDG score of -1, again lower than the scores in the benchmark ($U = 119760; p < .001$). As the figure shows, both the biggest emitters in terms of scope 1 and 2 emissions, and especially those with high scope 3 emissions, show diversity in SDG scores. In the former, we find 62 companies with negative SDG scores, 16 with a neutral score, and 22 that have a positive SDG score. In the latter, 51, 7, and 42 companies respectively have negative, neutral, and positive SDG scores.

5.3.2 ESG ratings

ESG raters have diverging views on GHG emissions. The companies that Sustainalytics rates as facing high or severe ESG risks account for 64% of the benchmark's scope 1 and 2 emissions, and for 55% of total scope 3 emissions. Companies that MSCI rates as ESG laggards generate 33% of the benchmark's scope 1 and 2 emissions and 16% of scope 3 emissions. Firms rated in the bottom-25% by Refinitiv and S&P account for 15% and 11% of all scope 1 and 2 emissions, and for 12% and 9% of scope 3 emissions. Figure 7 shows these distributions compared to the benchmark.

--- insert figure 7 ---

First, Sustainalytics assigns poorer ratings to high emitting companies than the benchmark, both for scope 1 and 2 emissions ($z = 9.615; p < .001$) and for those with high scope 3 emissions ($z = 8.863; p < .001$). Second, Refinitiv has a similar rating for companies in the benchmark and the highest scope 1 and 2 ($z = 0.962; p = .168$) and scope 3 emitters ($z = -0.382; p = .351$). Third, S&P ESG ratings of the benchmark are similar to those of the highest scope 1 and 2 emitters ($z = -1.192; p = .117$) and to those of the highest scope 3 emitters ($z = 0.944; p = .173$). Finally, MSCI gives slightly better ratings to companies in the benchmark than to those top scope 1 and 2 emitters ($z = 7{,}243; p < .001$), and the highest scope 3 emitters ($z = 3{,}145; p = .002$).

5.4 Company examples

Which companies illustrate these results? Table 3 shows ten companies' SDG scores and ESG ratings, each related to a proposition. Explanations for these companies' SDG scores and (some of their) ESG ratings are provided to help understand why a particular company's rating is (mis)aligned with our propositions.

--- insert table 3 ---

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6. DISCUSSION

This section discusses implications of our findings for research and practice, highlights limitations, and presents future research avenues.

6.1 Sustainable investing research and practice

Our findings reveal that the SDG score aligns with the tests we developed for determining the construct validity of sustainability ratings in a sustainable investing context. First, companies that asset owners exclude due to their adverse impacts, and companies included in sustainable thematic funds due to their positive impacts, overwhelmingly and respectively receive negative and positive SDG scores that are significantly lower/higher than the SDG scores of the benchmark (propositions 1a, 1b). Second, SDG scores of companies that cause significant harm according to the EU taxonomy all are negative and significantly lower, while the SDG scores of companies generating substantial revenues from taxonomy-aligned climate change activities are mostly positive and significantly higher than the scores in the benchmark (propositions 2a, 2b). Third, supporting proposition 3a, we reveal that companies with negative SDG scores account for over 62% of scope 1 and 2 emissions and for 60% of scope 3 emissions, whereby the 100 most polluting companies in these two groups receive significantly lower scores than companies in the benchmark.

Despite divergence among individual ESG ratings, we find that all fall short of meeting these tests. First, Sustainalytics and S&P have alignment with proposition 1a as they assign (somewhat) poorer ratings to excluded firms compared to the benchmark. MSCI and Refinitiv give similar or better ratings to these firms and thus do not meet proposition 1a. The MSCI ESG rating is somewhat better for sustainable thematic firms than the benchmark, thus having some agreement with proposition 1b, while the other ratings do not align with this proposition. Second, Sustainalytics and MSCI assign slightly poorer ratings to companies breaching the EU Taxonomy's DNSH principle compared to the benchmark, while Refinitiv and S&P give better ratings to these firms. Hence, the former two have some alignment with proposition 2a while the latter two do not. Adding to that, whereas Sustainalytics gives somewhat higher scores to companies aligned with the EU taxonomy's climate change objectives, the other three raters score these companies on par with the benchmark. Hence, the Sustainalytics rating only slightly, and those of Refinitiv, S&P, and MSCI not at all, align with proposition 2b. Finally, Sustainalytics gives poorer ratings to high GHG emitting companies – in line with proposition

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3a – while the other three rating agencies give similar (Refinitiv; S&P) or better ratings (MSCI) to the most polluting companies – thus being misaligned with this proposition.

Based on these findings, we conclude that an SDG score like the one used in this paper can be used to create sustainable investing strategies that align with sustainable development ambitions. This contrasts ESG ratings. Although they are the mainstream sustainable investing metric, and despite the fact that investors and scholars frequently equate them with how good a company is for the world – constituting considerable ambiguity (Scheitza et al., 2022) – our results underscore that an ESG rating is not to be understood as measuring companies' contributions to sustainable development. Hence, we caution against using concepts like ESG, sustainability, and impact interchangeably. The reason for these diverging results can be explained by the aims of these two types of ratings. Whereas the SDG score explicitly aims to measure companies' positive and negative contributions to sustainable development, ESG ratings tend to ask if a company's profitability is at risk due to a company's performance on environmental, social, or governance issues. In other words, ESG ratings assess financial risks (Amel-Zadeh & Serafeim, 2018; Giese et al., 2019) while the SDG score surveys sustainability impacts. This is not to say that ESG ratings cannot be part of (sustainable) investing strategies. As the European Commission (2021) argues with its concept of 'double materiality', investors do well to both identify how sustainability considerations affect financial performance, and to determine how investments influence the real world. An ESG rating may inform the former dimension, while a sustainability rating like the SDG score can shed light on the latter. Because our results show that these different types of scores yield distinct results, they could complement one another.

Our findings have implications for sustainability research. Sustainable investing is widely regarded as a tool for promoting social and environmental sustainability (Betti, Consolandi & Eccles, 2018; Crona, Folke, & Galaz, 2021; Krosinsky, 2013; Stephenson, Hamid, Peter, Sauvant, Seric, & Tajoli, 2021; Zhan & Santos-Paulino, 2021), for raising the financing needed to attain the SDGs (UN, 2015a) and for making financial flows consistent with the Paris Agreement (UN, 2015b). But there is a paradox. Although sustainable investing is reaching significant scale and attracts major attention, a real shift towards more sustainable business practices is not taking shape (Busch et al., 2016; Dyllick & Muff, 2016). We shed light on this paradox. Since ESG ratings do not gauge a company's impacts on human and planetary wellbeing, as this paper demonstrated, then it cannot be expected that investment strategies incorporating ESG support sustainable development.

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These results also have implications for research methodologies. Scholars frequently use ESG ratings to measure sustainability performance. Some use ESG as an independent variable, in order to explain how sustainability performance influences dependent variables, such as financial performance (e.g., Friede, Busch, & Bassen, 2015), access to capital (e.g., Cheng, Ioannou & Serafeim, 2014; El Ghoul, Guedhami, Kwok & Mishra, 2011), or stakeholder management (e.g., Fu, Boehe & Orlitzky, 2021). Others use ESG as a dependent variable and investigate how sustainability performance is affected by independent variables, like a firm's home country (e.g., Ioannou & Serafeim, 2012; Linnenluecke, 2022), its degree of internationalization (e.g., Attig, Boubakri, El Ghoul & Guedhami, 2014), or its board composition (e.g., Arayssi, Jizi, & Tabaja, 2020; Manita, Bruna, Dang & Houanti, 2018). ESG ratings can be very useful in such research yet deserves reflection. As we show ESG ratings to inadequately capture companies' contributions to sustainable development, we advise researchers to carefully consider if the sustainability ratings they use measure what they intend to measure.

The key practical implication that follows from this study is that sustainable investors ought to target positive sustainable development contributions beyond avoiding ESG risks. Sustainable investing strategies that are solely based on ESG ratings are likely to invest in companies that cause harm while missing investments in companies providing solutions for sustainability challenges – as ESG ratings were shown to be largely unable to distinguish between firms with negative impacts, positive impacts, and the benchmark. Thus, excluding the worst ESG-performers (negative screening) or prioritizing the best ones (positive screening) will not lead investors to support sustainable development. Annex 1 illustrates these practical implications in more detail.

6.2 Limitations

Three limitations merit discussion. First, although there are only few SDG-type scores on the market, there is a possibility that there is divergence among SDG scores – similar to the divergence among ESG ratings. While variance will be inevitable, we expect divergence among SDG scores to be lower than among ESG ratings. The reason is that an SDG assessment will have the SDGs as a North Star for assessing impact. Such a universal blueprint against which sustainability is being assessed is lacking for ESG assessments, which is one source of their divergence (Berg et al., 2022). Second, in assessing if sustainability ratings align with investors' revealed sustainability preferences we had to rely on information from Western

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investors which may introduce a cultural bias. Investors from other regions may employ different exclusion lists and might deploy other sustainable thematic funds. Third, there is a risk that the tests we developed yield mechanical correlations that reflect the methodologies, rather than the outcomes, of the sustainability ratings in our study. We mitigated this risk by focusing, to the extent that we are aware, on dimensions that are not directly taken into account in the sustainability rating's designs. To explain, the SDG score does not explicitly assess investors' exclusion policies (although it aligns with Robeco's exclusion list, which is why we did not include this list in our tests), it does not directly link to how sustainable thematic funds are built, it does not directly integrate the EU taxonomy, and it does not steer on companies' GHG emissions. To the best of our knowledge, the ESG ratings included in our study do not directly capture investors' exclusions, sustainable thematic investments, the EU taxonomy, or GHG emissions.

6.3 Future research

We offer suggestions for future research along two lines. First, testing which ESG ratings are best able to identify financially-material risks could clear the confusion caused by the divergence of ESG ratings (cf. Berg et al., 2022). That there is divergence among these ratings is important knowledge. A follow-up question asks which of these ESG ratings best measures what they are supposed to. The tests presented in this paper reveal that none of the ratings adequately assess companies' contributions to sustainable development. Similar types of tests can gauge if risks that stem from ESG factors are adequately identified by different ratings – which tend to be the promise of ESG ratings.

Second, research on how investors impact the real is important and draws increased interest (Kölbel et al., 2020). Scholars have recently differentiated between impact-aligned investing and impact-generating investing (Busch et al., 2021). The former seeks to allocate capital away from companies with negative impacts and towards those providing positive solutions, while the latter sees investors actively create change, for instance through active ownership. Research on how these two types of strategies may lead to changes in the real world is in its infancy. For impact-aligned investing, it seems that unsustainable firms do not have lower access to financing than more sustainable firms (Blitz, Swinkels, & van Zanten, 2021) and divesting from stocks with negative impact is seen to have only a small, if any, effect on a company's cost of capital (Berk & van Binsbergen, 2021). These findings may change if sustainable investing reaches a larger scale, and divestment still gives an important signal to

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markets, regulators, and other stakeholders on how investors assess sustainability (Kölbel et al., 2020). For impact-generating investing, scholarship on how investors may influence companies' sustainability policies is increasing (Barko et al., 2021; Bauer et al., 2022; de Groot et al., 2021; Dimson & Karakas, 2015; Doidge, Dyck, Mahmudi & Virani, 2019; Dyck, Lins, Roth & Wagner, 2019), whereby early evidence suggests that active ownership may drive sustainability performance (Kölbel et al., 2020). Investigations into the strategies that investors may employ to promote sustainable development, and the impact that this has on the real world, is worthwhile.

7. CONCLUSION

Sustainable investors need to know how the companies they might invest in impact societies and the environment. However, there is considerable disagreement about how best to measure corporate sustainability performance. We developed three tests for gauging the construct validity of sustainability ratings. Jointly, these tests investigate if a rating aligns with: (i) investors' revealed sustainability preferences; (ii) sustainable investing regulation; and (iii) climate science. We applied these tests to two types of sustainability ratings: (i) a score that measures companies' contributions to the SDGs; and (ii) conventional ESG ratings. Including these two types of ratings allowed us to assess if the novel SDG score enjoys discriminant validity relative to mainstream sustainable investing ratings.

The SDG score performed well on our tests. This score: (i) captures investors' revealed sustainability preferences by assigning poor scores to companies on asset owners' exclusion lists and giving good scores to companies in sustainable thematic funds; (ii) aligns well with the EU taxonomy by giving poor scores to companies breaching the 'do-no-significant-harm' principle and good scores to firms generating significant revenues from taxonomy-aligned activities; and (iii) contributes to climate change mitigation ambitions by assigning poor scores to the majority of companies with very high emissions. We found that ESG ratings, which generally gauge if companies face sustainability risk rather than measuring their sustainability impacts, do not score well on these tests. Hence, the SDG score has high, and ESG ratings low, construct validity as a sustainability rating. These divergent results indicate that there is discriminant validity between the SDG score and ESG ratings, and that they might be used complementarily.

Overall, by developing three tests that assess if sustainability ratings capture companies' contributions to sustainable development, this paper contributed greater clarity

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around interpretating and valuing the metrics that are used in sustainable investing. We posit that if sustainable investors are to support creating a better world, they need ratings that measure companies' positive and negative impacts on the wellbeing of people and planet.

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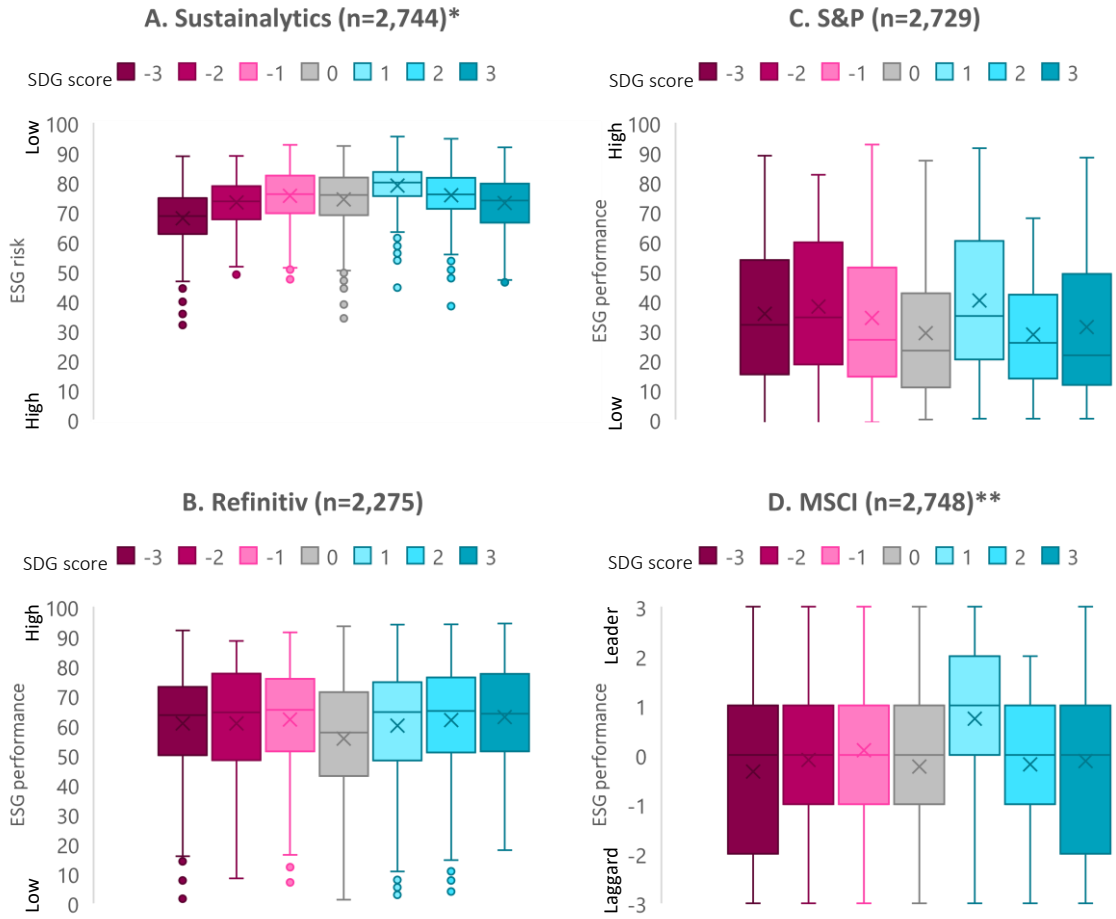
Figure 1 – Distribution of ESG ratings for companies with each of seven types of SDG scores


A. Sustainalytics (n=2,744)*
SDG score -3 -2 -1 0 1 2 3
ESG risk
Low
High
100 90 80 70 60 50 40 30 20 10 0
C. S&P (n=2,729)
SDG score -3 -2 -1 0 1 2 3
ESG performance
High
Low
100 90 80 70 60 50 40 30 20 10 0
B. Refinitiv (n=2,275)
SDG score -3 -2 -1 0 1 2 3
ESG performance
High
Low
100 90 80 70 60 50 40 30 20 10 0
D. MSCI (n=2,748)**
SDG score -3 -2 -1 0 1 2 3
ESG performance
Leader
Laggard
3 2 1 0 -1 -2 -3

*Sustainalytics ESG ratings rank from 0 (low ESG risk) to 100 (high ESG risk). To align with the results of the other rating agencies, who assign higher ratings to better performing companies, the Sustainalytics ESG ratings have been reversed in this graph by subtracting them from 100.

** MSCI assigns seven types of ESG ratings to companies, varying from AAA (leader) to CCC (laggard). The ratings were converted to a numerical scale, ranging from +3 (leader, AAA) to -3 (laggard, CCC).

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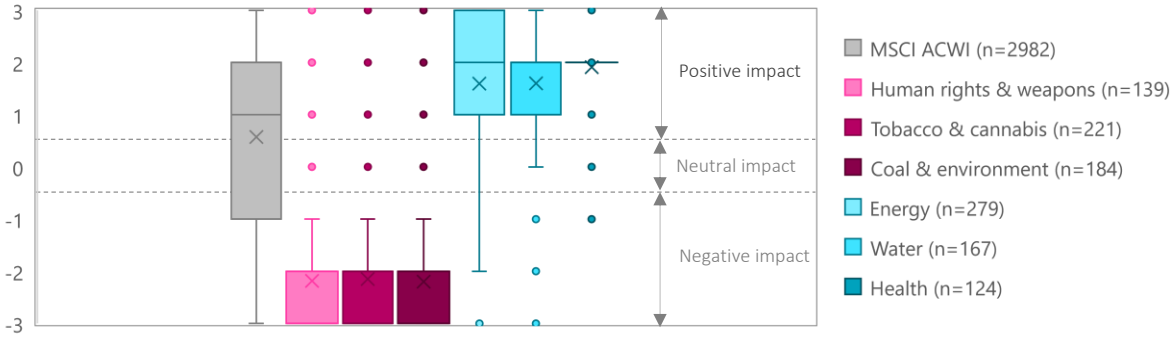
Figure 2 – Distribution of SDG scores for companies on exclusion lists, in sustainable thematic funds, and the benchmark



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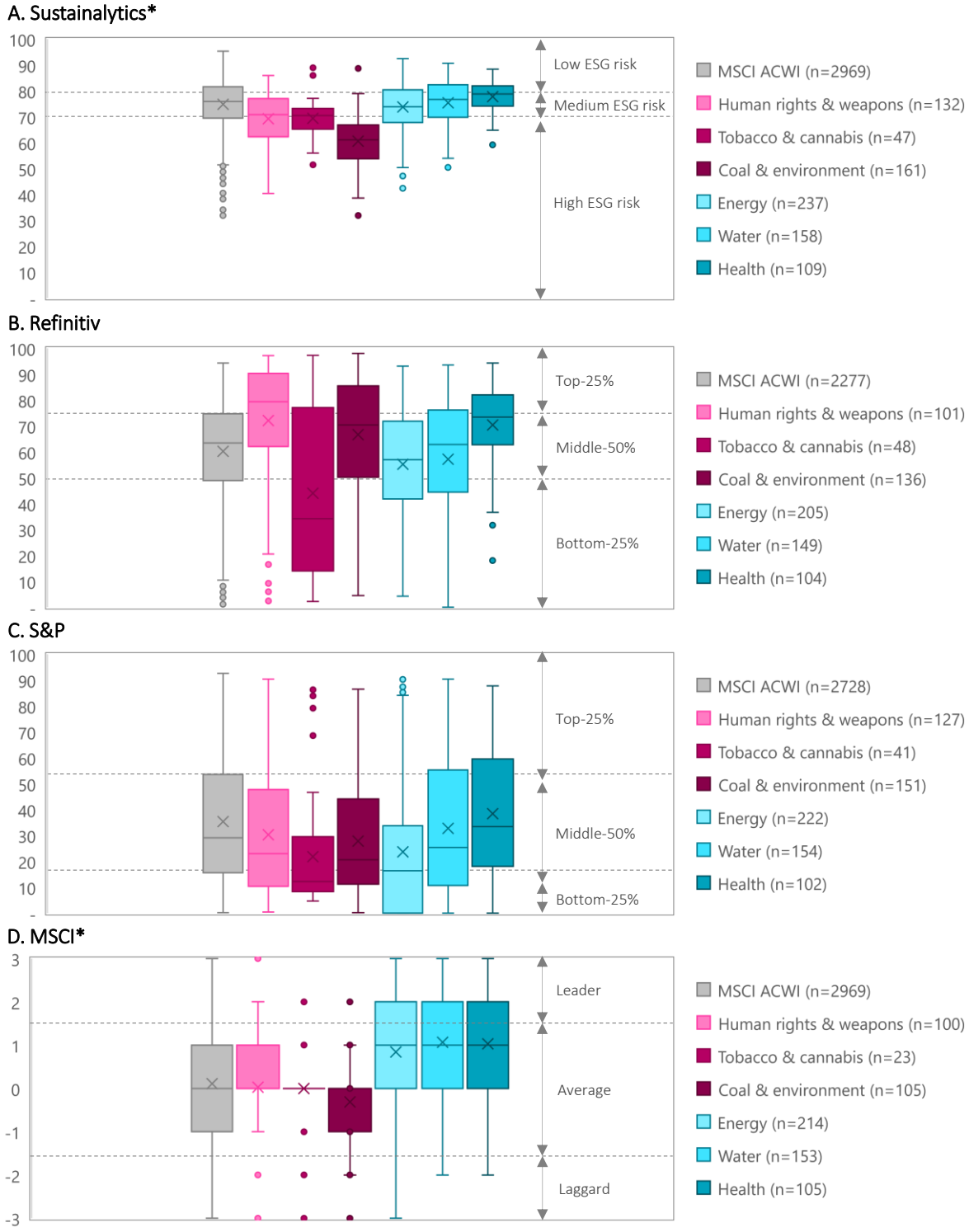

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Figure 4 – Distribution of SDG scores for companies breaching the EU Taxonomy's Do No Significant Harm principle, for companies with particular shares of EU Taxonomy aligned revenues, and the benchmark

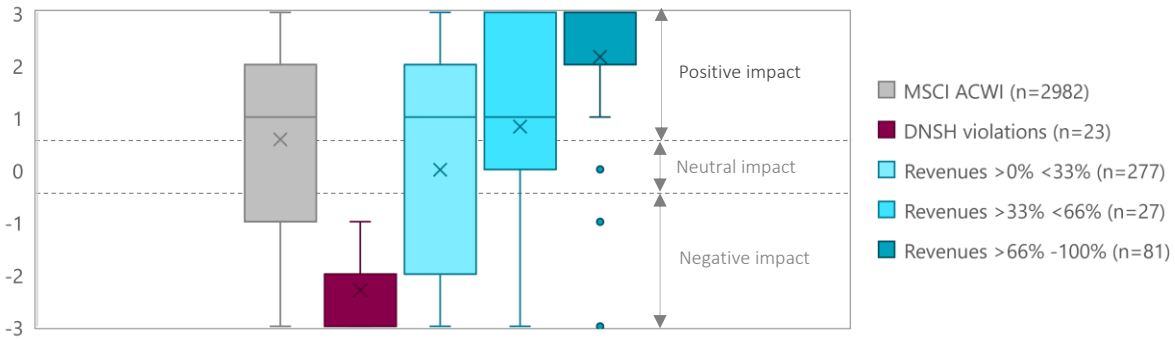

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Figure 5 – Distribution of ESG ratings for companies breaching the EU Taxonomy's Do No Significant Harm principle, for companies with particular shares of EU Taxonomy aligned revenues, and the benchmark

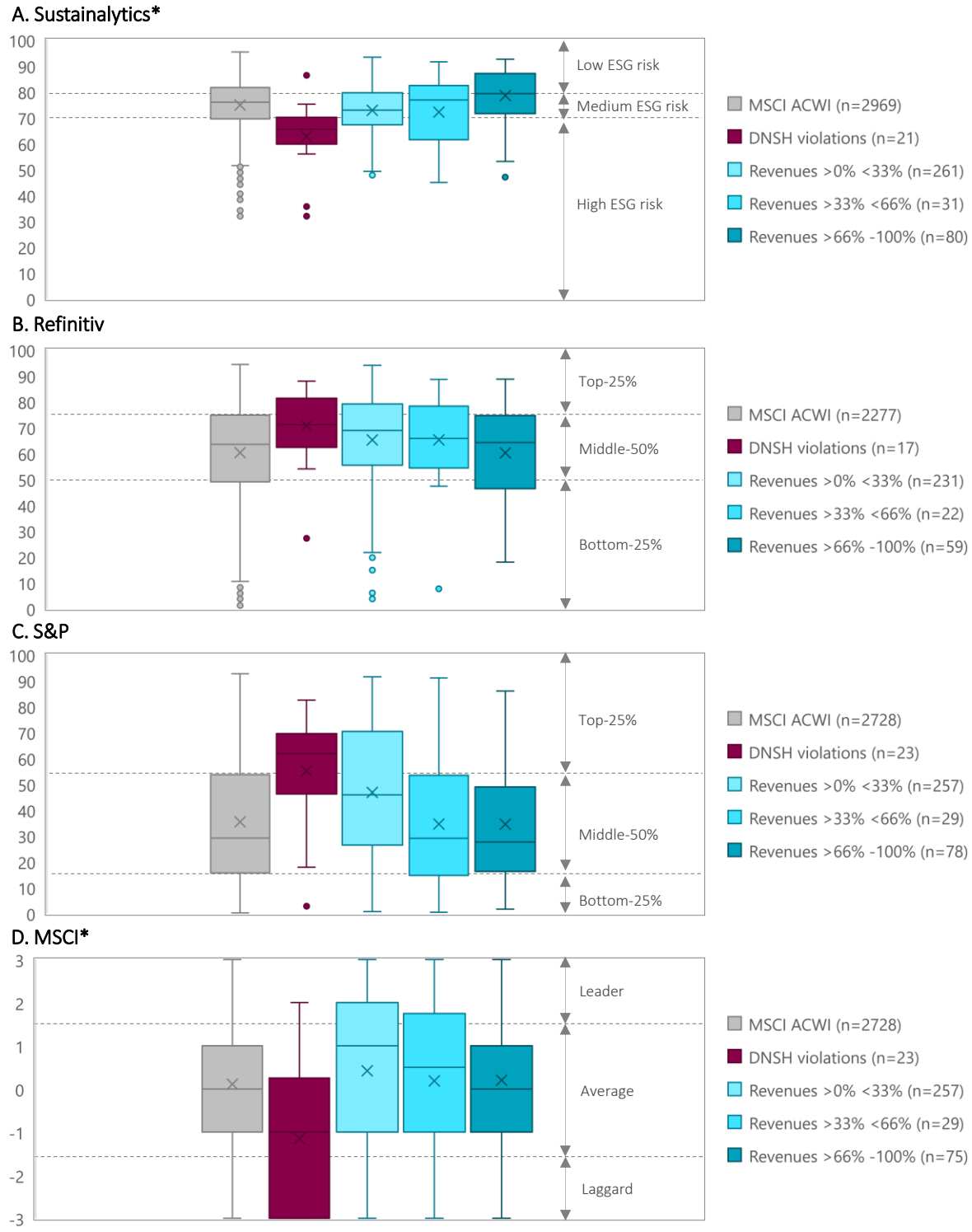

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Figure 6 – Distribution of SDG scores for the 100 companies with the highest scope 1 and 2 emissions, the 100 companies with the highest scope 3 emissions, and the benchmark

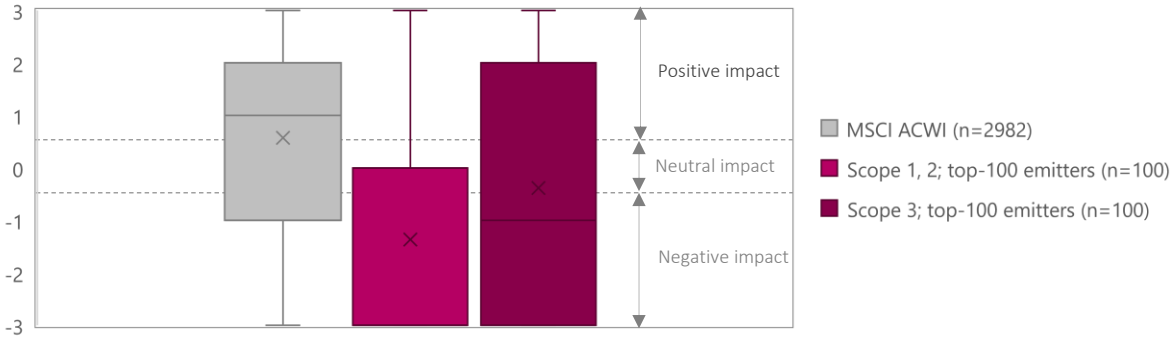

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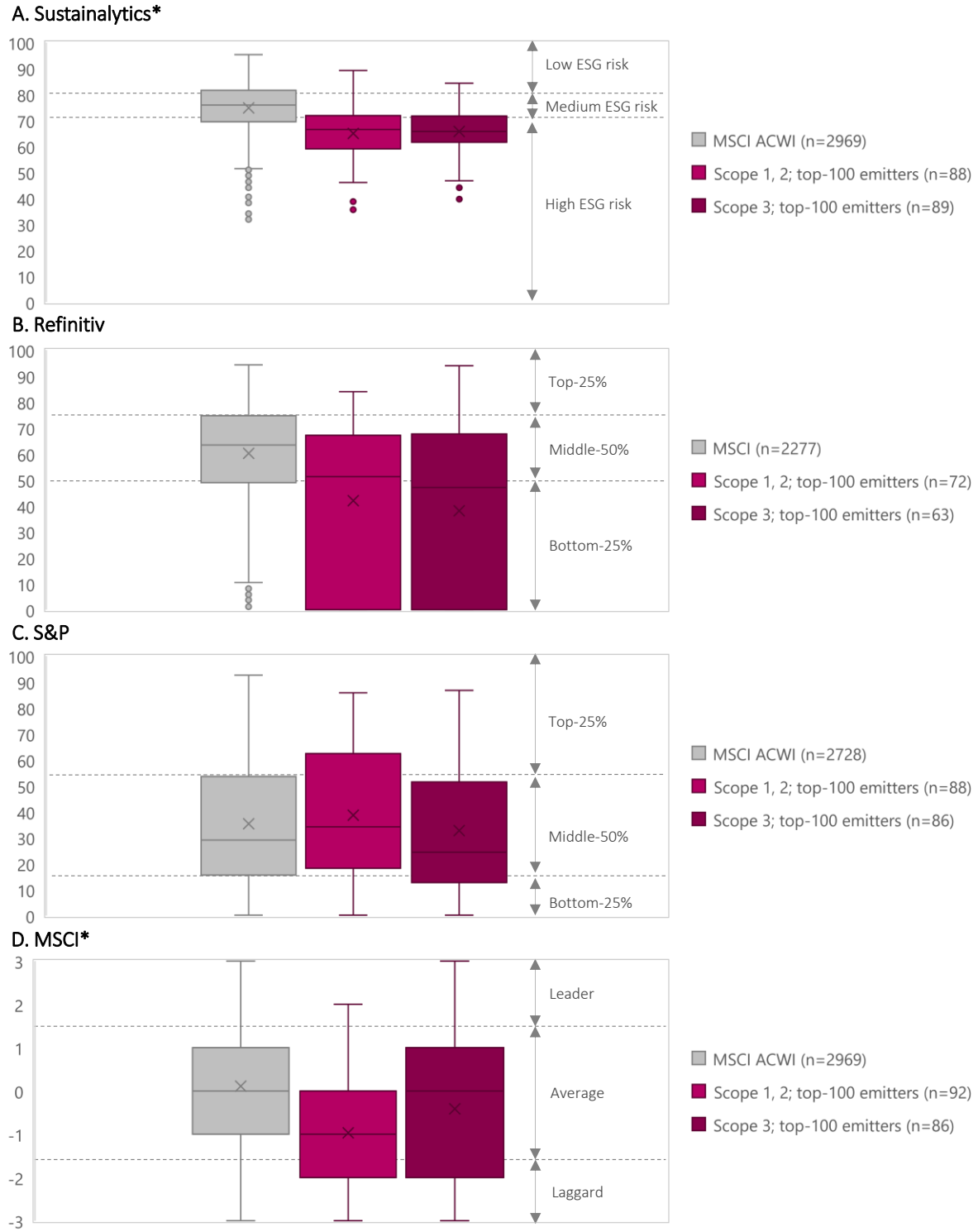
Figure 7 – Distribution of ESG ratings for the 100 companies with the highest scope 1 and 2 emissions, the 100 companies with the highest scope 3 emissions, and the benchmark



*Sustainalytics ESG ratings rank from 0 (low ESG risk) to 100 (high ESG risk). To align with the results of the other rating agencies, who assign higher ratings to better performing companies, the Sustainalytics ESG ratings have been reversed in this graph by subtracting them from 100.
** MSCI assigns seven types of ESG ratings to companies, varying from AAA (leader) to CCC (laggard). The ratings were converted to a numerical scale, ranging from +3 (leader, AAA) to -3 (laggard, CCC).

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Table 1 – Overview of exclusion lists

Asset owner / fund	Country	Description	Assets (billion USD)	Topics on exclusion list	Number of companies on exclusion list
Norway Government Pension Fund Global	Norway	National Norwegian pension fund	1.344,3	Coal; Nuclear; Tobacco; Human rights; Environment; Weapons	181
ABP	Netherlands	Pension fund for government and education professionals	586,3	Weapons; Nuclear; Tobacco	298
Pensioenfonds Zorg en Welzijn (PFZW)	Netherlands	Pension fund for health care and social work professionals	294,7	Tobacco; Coal; Weapons; Tar sands	207
Sjunde AP-fonden (AP7)	Sweden	Swedish premium pension system	83,9	Nuclear; Human rights; Cannabis; Environment; Labor rights; Weapons	86
NZ Super Fund	New Zealand	New Zealand Government savings vehicle	42,0	Cannabis; Tobacco; Nuclear; Weapons	291
Beroepsvervoer over de Weg	Netherlands	Pension fund for transport and logistics sector	41,8	Tobacco; Coal; Weapons; Human rights; Tar sands; Environment	225
Medische Specialisten (SPMS)	Netherlands	Pension fund for health care professionals	16,0	Tobacco; Nuclear; Controversial weapons	189

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Table 2 – Overview of sustainable thematic funds

	Fund name	Inception	Number of holdings	Assets under management (million US$)
Energy	First Trust Global Wind Energy ETF	2008	48	351
	First Trust Nasdaq Cln Ed	2017	70	27
	First Trust NASDAQ® Clean Edge® Green Energy Index Fund (QCLN)	2007	60	3.015
	Invesco Global Clean Energy ETF	2007	141	358
	Invesco WilderHill Clean Energy ETF	2005	72	1.725
	iShares Global Clean Energy	2007	76	5.818
	RobecoSAM Smart Energy Equities*	2006	62	4.198
Water	Allianz Global Water	2018	41	1.024
	Calvert Global Water	2008	118	563
	Ecofin Global Water ESG IndexCo	2017	42	67
	First Trust Water ETF	2007	37	1.532
	Invesco S&P Global Water Index ETF	2007	58	1.248
	Invesco Water Resources ETF	2005	38	2.062
	RobecoSAM Sustainable Water Equities*	2001	74	3.775
Health	Fidelity Global Health Care Fund	2000	59	1.954
	RobecoSAM Sustainable Healthy Living Equities*	2007	46	917
	SPDR MSCI Europe Health Care	2014	40	842

*The RobecoSAM branded funds did not, at the time of analysis, systematically include Robeco SDG scores into the investment process.

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Table 3 – Company examples of SDG scores and ESG ratings

Proposition	Company name	SDG score	Sustaina-lytics ESG*	Refinitiv ESG	S&P ESG	MSCI ESG	Explanation
1a - Tobacco exclusion	British American Tobacco	-3	73	97	86	BBB	Manufactures, distributes, and sells tobacco and cigarette products explaining the -3 SDG score. ESG ratings are average or good. For instance, Refinitiv gives it particularly high scores for governance, but also gives good ratings for the E and S pillars.
1a - Coal exclusion	CLP Holdings Limited	-3	72	92	77	AA	Generates about a third of its revenues from thermal coal, explaining the -3 SDG score. Whereas Sustainalytics says the company faces medium ESG risk, primarily due to climate change issues, Refinitiv gives it good scores across the E, S, and G dimensions.
1a - Human rights exclusion	Deutsche Telekom AG	1	83	94	90	BBB	On the exclusion list of an asset owner for labor rights violations in the US in 2016. SDG score maintains that the controversy is not significant enough to warrant a negative score. ESG ratings are good and average.
1b - Sustainable water	Evoqua Water Technologies Corp	3	73	48	12	A	Creates equipment and services for treating effluent water, explaining the +3 SDG score. ESG ratings are poor or average. E.g., Sustainalytics says the company faces medium ESG risk, especially in the areas of product governance, human capital and corporate governance.
1b - Energy	Eaton Corp PLC	-3	83	70	34	BBB	Produces electrical equipment related to power distribution, storage, and safety, but also is involved in military contracting, explaining the -3 SDG score. ESG ratings are average and good. For instance, the Sustainalytics rating concludes the company faces low ESG risk across all E, S, and G dimensions it assesses.
1b - Health	Siemens Healthineers AG	2	77	76	25	BB	Provides medical technology services leading to a +2 SDG score. Receives diverse ESG ratings. E.g., MSCI rates it as a laggard in areas like corporate governance and product safety and quality.
2a - EU taxonomy DNSH	Royal Dutch Shell PLC	-2	65	93	65	AA	Sustainalytics' EU taxonomy solution explains that Shell breaches the DNSH principle due to "severe environmental pollution in relation to oil spills over several decades" in Nigeria (Sustainalytics, 2022). Whereas the SDG score indicates the company's adverse environmental impact, some ESG raters assign it high scores. Refinitiv for instance gives it high ratings in all E, S, and G dimensions.
2b - EU taxonomy alignment	Daqo New Energy	3	71	46	17	B	Sustainalytics' EU taxonomy solution states 100% of the company's revenues to be aligned with the EU taxonomy. The SDG score reflects the company's high positive contributions to Climate Action. It gets average or poor ESG ratings. For instance, MSCI rates it as a laggard, primarily due to human capital development.
3a - Scope 1 and 2 GHG emissions	RWE AG	-3	77	68	69	A	Ranks among the 100 highest emitting companies in terms of scope 1 and 2. The -3 SDG score is explained by the coal it uses to generate power. It gets good and average ESG ratings. For instance, MSCI rates it as a leader for corporate governance and for opportunities in renewable energy.

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3a - Scope 3 GHG emissions	Shaanxi Coal Industry Co Ltd	-3	53	38	2	CCC	Ranks among the 100 highest emitting companies in terms of scope 3. Its coal mining activities lead to a -3 SDG score. It gets poor ESG ratings. For instance, Refinitiv gives it moderate scores for the Environment dimension and poor scores for the Social and Governance dimensions

**Sustainalytics ESG ratings rank from 0 (low ESG risk) to 100 (high ESG risk). To align with the results of the other rating agencies, who assign higher ratings to better performing companies, the Sustainalytics ESG ratings have been reversed in this graph by subtracting them from 100.*

The colors in this table correspond to the assigned scores. Robeco SDG scores that are negative are colored red while positive scores are colored green. Sustainalytics ESG ratings that indicate low, medium, and high risk are respectively colored green, yellow, and red. Refinitiv and S&P ESG ratings that are in the top-25%, middle-50%, and top-25% relative to the MSCI ACWI benchmark are respectively colored green, yellow, and red. MSCI ESG ratings that signal leaders, average, and laggards are respectively colored green, yellow, and red.

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Annex 1

This annex illustrates the sustainable investing implications of our study. In table 4 we create two hypothetical sustainable investing scenarios, using MSCI ACWI as investment universe. Scenario one excludes the worst scoring companies. Scenario two retains the best performers. The table describes how these scenarios might be applied to each of the sustainability ratings used in our study, whereby we set exclusion and inclusion thresholds based on the providers' definitions of what is good/bad performance (Robeco; Sustainalytics; MSCI) or based on their relative scores in the benchmark (Refinitiv; S&P). We show investment implications, i.e., the percentage of companies that are excluded from the investment universe. We also shows sustainability implications, including: (i) how many companies with negative impact still are *included* in the investment universe, whereby a low number indicates that adverse impacts are avoided; (ii) how many companies with positive impact are *excluded* from the investment universe, whereby a low number signals that positive impacts are prioritized; and (iii) what proportion of the universe's GHG emissions is *avoided*.

To explain, using an SDG score for the first scenario reduces the investment universe by 25%. In the remaining universe, we find 12% of companies excluded by asset owners and 0% of companies breaching the EU taxonomy's DNSH principle. At the same time, 9% and 4% of companies included in sustainable thematic funds and those generating over two-thirds of revenues from taxonomy-aligned solutions fall outside of this universe. Moreover, the remaining universe avoids some 60% of GHG emissions. The table underscores that ESG ratings lead to results that are much less aligned with sustainable development ambitions, which can be explained by their focus on financial materiality rather than sustainability impact. Overall, sustainable investors do well to go beyond avoiding ESG risks and assess companies' sustainable development impacts. Strategies that solely integrate ESG ratings are likely to invest in companies with negative impacts while missing investments in companies with positive contributions. This makes them likely to fall short of meeting their – and their clients' – sustainability objectives.

Table 4 – Implications of using an SDG score or ESG ratings in sustainable investing strategies

Sustainability rating	Indicator	Sustainable investing strategy	
		1. Negative screening	**2. Positive screening**
Robeco SDG score	SI strategy description	Excluding companies with negative (-1; -2; -3) SDG scores from the investment universe	Including companies with a positive (+1; +2; +3) SDG score in the investment universe
	Investment implications: % of companies excluded from MSCI ACWI	25%	44%
	Exclusion: % of companies excluded by asset owners *included* in the investment universe	12%	9%
	Sustainable thematic: % of companies in sustainable thematic funds *excluded* from the investment universe	9%	14%
	DNSH harm: % of companies violating the EU Taxonomy's 'do no significant harm principle *included* in the investment universe	0%	0%
	EU taxonomy alignment: % of companies with >66% taxonomy aligned revenues *excluded* from the investment universe	4%	15%
	Climate change: absolute scope 1 and 2 emissions of the benchmark avoided	62%	76%
	Climate change: absolute scope 3 emissions of the benchmark avoided	60%	72%
Sustainalytics ESG rating	SI strategy description	Excluding companies with	Including companies with

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		severe and high risk ESG ratings from the investment universe	negligible and low ESG risk rating in the investment universe
	Investment implications: % of companies excluded from MSCI ACWI	27%	60%
	Exclusion: % of companies excluded by asset owners *included* in the investment universe	35%	8%
	Sustainable thematic: % of companies in sustainable thematic funds *excluded* from the investment universe	25%	70%
	DNSH harm: % of companies violating the EU Taxonomy's 'do no significant harm principle *included* in the investment universe	24%	5%
	EU taxonomy alignment: % of companies with >66% taxonomy aligned revenues *excluded* from the investment universe	18%	55%
	Climate change: absolute scope 1 and 2 emissions of the benchmark avoided	64%	77%
	Climate change: absolute scope 3 emissions of the benchmark avoided	55%	74%
Refinitiv ESG rating	SI strategy description	Excluding companies with a bottom-25% ESG rating from the investment universe	Including companies with a top-25% ESG rating from the investment universe
	Investment implications: % of companies excluded from MSCI ACWI	25%	75%
	Exclusion: % of companies excluded by asset owners *included* in the investment universe	73%	50%
	Sustainable thematic: % of companies in sustainable thematic funds *excluded* from the investment universe	28%	71%
	DNSH harm: % of companies violating the EU Taxonomy's 'do no significant harm principle *included* in the investment universe	94%	47%
	EU taxonomy alignment: % of companies with >66% taxonomy aligned revenues *excluded* from the investment universe	31%	76%
	Climate change: absolute scope 1 and 2 emissions of the benchmark avoided	15%	71%
	Climate change: absolute scope 3 emissions of the benchmark avoided	11%	56%
S&P ESG rating	SI strategy description	Excluding companies with a bottom-25% ESG rating from the investment universe	Including companies with a top-25% ESG rating from the investment universe
	Investment implications: % of companies excluded from MSCI ACWI	25%	75%
	Exclusion: % of companies excluded by asset owners *included* in the investment universe	59%	17%
	Sustainable thematic: % of companies in sustainable thematic funds *excluded* from the investment universe	23%	73%
	DNSH harm: % of companies violating the EU Taxonomy's 'do no significant harm principle *included* in the investment universe	91%	17%
	EU Taxonomy alignment: % of companies with >66% taxonomy aligned revenues *excluded* from the investment universe	22%	79%
	Climate change: absolute scope 1 and 2 emissions of the benchmark avoided	12%	65%

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	Climate change: absolute scope 3 emissions of the benchmark avoided	9%	63%
MSCI ESG rating	SI strategy description	Excluding ESG laggards (CCC and B rating) from the investment universe	Including ESG leaders (rating AAA; AA) in the investment universe
	Investment implications: % of companies excluded from MSCI ACWI	18%	77%
	Exclusion: % of companies excluded by asset owners *included* in the investment universe	79%	14%
	Sustainable thematic: % of companies in sustainable thematic funds *excluded* from the investment universe	4%	62%
	DNSH harm: % of companies violating the EU Taxonomy's 'do no significant harm principle *included* in the investment universe	54%	8%
	EU taxonomy alignment: % of companies with >66% taxonomy aligned revenues *excluded* from the investment universe	19%	76%
	Climate change: absolute scope 1 and 2 emissions of the benchmark avoided	33%	76%
	Climate change: absolute scope 3 emissions of the benchmark avoided	16%	72%

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